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ABSTRACT

As a prelude to testing deductions from the Ferguson and other ability theories that environment influences patterns of ability, school children in 5 large and 11 small isolated communities on the South Coast of Newfoundland were tested to compare ability patterns of children in small places with those in large communities. Data used for comparison in the 1969 study were gathered from all students in grades five, six, and seven by means of the Otis Quick Scoring Test of Mental Ability, the Raven Progressive Matrices, and the Primary Mental Abilities Test. Results showed: (1) no difference in level of general intelligence between children from large and small isolated communities, (2) children from large communities excelled on the verbal intelligence test, verbal meaning, and reasoning, (3) children in small communities excelled on the space test, and (4) no difference was found in number and word fluency. Because it was shown that different patterns of ability do exist in these small and large isolated communities and because people are moving from small to larger places, the South Coast of Newfoundland was deduced to be an ideal testing ground for the theory that children moving from areas where patterns of ability are different will show changes in ability patterns in line with stresses imposed by a new environment. (RS)

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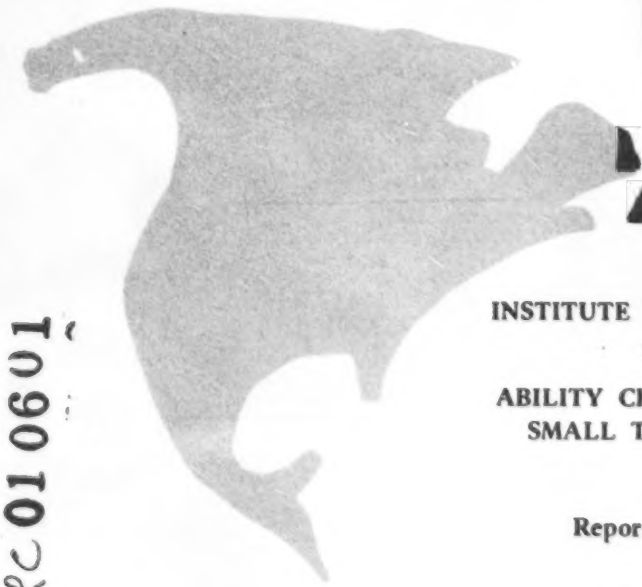

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ABILITY CHANGES IN CHILDREN MOVING FROM SMALL TO LARGE ISOLATED COMMUNITIES

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A Conceptual Framework

Ferguson (1954, 1956) has given us a theory of human ability derived in part from Hebb's (1949) notion that inheritance sets the limits for intellectual functioning but that environmental effects, operating through learning, greatly influence the level. Ferguson states that intellectual abilities in adults are fairly stable but in children increase in level with age. The role of culture in shaping abilities is considered crucial since cultures "prescribe what shall be learned and at what age" (Ferguson, 1954, p. 299). Therefore, people reared in different environments will show different patterns of ability when compared at equivalent ages and the patterns will change differentially over time. General intelligence is equated, by implication at least, with positive transfer; the greater the general intelligence, the greater the ability to utilize existing information and to incorporate new information. Therefore, one would predict that children moving from one environment to another would show changes in ability patterns in a direction such that their new ability patterns would become more like the patterns existing in the new environment. A further prediction from the theory is that children of higher general intelligence would change in the stated direction more rapidly than children of lower intelligence since their ability to utilize their existing abilities for the purpose would be greater. Also, older children would show less change from the old to the new pattern than would younger children.

Vernon (1965, 1969), Guilford (1967), Cattell (1963) and Cattell and Butcher (1968) refer favourably to Ferguson's theory. For his own part, Vernon

(1965, 1969) has outlined his own theory, which is quite similar to Ferguson's. Basic to Vernon's structural theory is the idea of general intelligence, which heads a hierarchy of abilities. At the next level is a verbal-educational (v:ed) factor and a spatial-perceptual-practical (k:M) factor. These major factors then subsume other, more specific, abilities. Vernon's theory states that environments determine the relative levels of the specific factors; cultures, whose use of symbolic material is limited, would score relatively lower on v:ed than on k:M. Vernon's theory is more difficult to predict from than is Ferguson's but it seems reasonable that we should expect children (whose general intelligence permits) to improve in v:ed abilities when they move to environments in which such abilities are more advanced.

Cattell (1963), and Cattell and Butcher (1968) have proposed a theory of intelligence with implications like Vernon's. They refer to crystallized ability which is indicated by the existing level on certain tests like those of verbal and numerical ability. Cultural differences are usually reflected in the discrepancy between crystallized and fluid intelligence, the latter being evidenced by the capacity of people to adapt to new situations. The authors suggest that that rate of learning will be a function of the level of the ability factor in a given location, which implies that people moving to an area where differential stress is put on ability patterns will show change patterns in the direction imposed by the stress. Again, these predictions are the same as those derived from Ferguson.

Evidence in support of Ferguson's theory has come from experiments by Roberts, King and Kropp (1969). Their study was designed to test certain predictions from Ferguson's theory related to specific learning rather than cultural or environmental effects. One of their comments is revealing, i.e., "although there is growing evidence that the points made by Ferguson (1954,

1956) are reasonable, no studies have been reported that systematically test hypotheses drawn from his conceptual framework". Their study, of course, is one of the first but, as indicated, is based on predictions about learning performance in the lab rather than on predictions of the effect of more global influences on ability. Our study would compliment these laboratory approaches.

The Project

The South Coast of the Island of Newfoundland is incredibly isolated. Transportation to communities there is by boat (aircraft are available for emergencies) and telecommunication is usually by radio telephone. Medical services, electricity, water, and sewage are available only in the largest places. The smaller villages have none of the amenities of modern municipal life. The schools in the smaller places tend to have only two rooms while the larger communities have schools that compare favourably with those in urban areas. Every place gets some television, but newspapers are rare and, when available, are usually several days late.

The people who live on the South Coast of Newfoundland are quite homogeneous in racial background. There has been virtually no in-migration for quite some time. The traditional occupation has been fishing, singly in small boats, although lately, with the advent of fish plants, more diverse employment opportunities have become available. Also, many men now work away from home in lumbering trades or as crew on ships. Most adults have very little education and are probably "functionally illiterate".

Great changes are being brought on these people. They are being encouraged to abandon their communities and move to larger areas. The Federal and Provincial governments have a "resettlement" programme, under which people are given financial assistance to move. The programme works this way. When

80 per cent of the adult members of a community agree to move, aid is given to them to do so. Usually whole communities migrate replete with houses which are taken by barge or floated to the new location. The migration, therefore, is not selective.

We have an opportunity, then, to observe the effects of relatively large scale unselective migration. If the ability patterns of children in the small places are different than those of children in the large communities, we would have the makings of a natural experiment in which we can test deductions from Ferguson's theory and the other theories of ability. As you will see, the patterns of ability are different on the South Coast so that we are able to do just that.

Previous Studies

The relation of change in intellectual abilities to migration has been confined largely to negro movement from the south to the north in the United States. Klineberg (1935) and Lee (1951) are two migration studies which showed children improved with length of stay in the north. Since Lee's is the more recent and the more refined, it will be examined in the light of some of its drawbacks, which stem from the fact that Lee did not have many of the opportunities that we do. Lee's samples were chosen after the fact of movement, and there is considerable doubt they were unbiased as he admits, e.g., he chose certain specific schools in Philadelphia and in those chose his subjects by taking every fifth student. For our part we are able, because our population is smaller, to include the whole of it in our study, eliminating the problem of sampling bias.

Lee did not have any measures on his subjects before they migrated, a serious drawback since a baseline measure would have given vital information.

It is conceivable that moving itself could have a depressing effect on ability levels, which disappears with time. We have no way in Lee's study to discount that possibility because of the lack of pre-measures. In our study we do have measures on the children before they move.

The lack of pre-measures in Lee's study extends, of course, to pre-migration environmental conditions. We are given no information concerning where the children came from. Lee was attempting to replicate Klineberg's earlier study which was done on southern urban Negro children. It is, therefore, probably fair to suspect that most of Lee's subjects migrated from southern cities. It is interesting to note that there was no difference in pattern of ability between the southern born and the Philadelphia born children. That bears out the notion of a depressing effect either operating in the old environment or coming about because of the move. The lack of pattern differences would also indicate that the environments (southern vs. northern) were not qualitatively different (except perhaps in a general depressive effect). The children of the south coast of Newfoundland, as will be seen, exhibit ability pattern differences which are related to size of isolated community in which they live. Therefore, when they move they will experience differential stresses on existing ability patterns. Needless to say, Ferguson's theory can be better tested under conditions where differential stresses apply than any unspecific stresses.

Another drawback related to the lack of a pre-measure on the migrating children in Lee's study is that there is no follow-up of children still in the old environment. One of the advantages of our study is that we can do just that. Some, but not all, of the communities on which we have pre-measures will have moved and others will not. Therefore, we can assess the development of abilities of children in the smaller isolated communities, and in the larger

communities, of those children who were already there and those who moved in. We will be able to get control data from the people who haven't yet moved, an advantage not enjoyed by Lee.

Baseline Data

These data were collected in May, 1969. A list of the communities visited is given in Table 1, along with some information on number of children attending school in 1968-1969 and the number of classrooms in each community. Those communities designated large have above the mean number of children in school and above the mean number of classrooms. The small communities are below the mean on both measures.

Insert Table 1 about here

All the children in Grades IV to XI in each of the communities were given a number of intelligence tests. However, there were so few children below Grade V and above Grade VII that no meaningful comparisons can be made. Therefore, the results to be reported are based on Grades V, VI, and VII only.

Age. The number of subjects in each cell and their mean ages in months are shown in Table 2. The analysis of variance is also shown there. There were significant grade and significant sex differences. The Grade V's were 11 years 9 months average age, the Grade VI's, 12 years 5 months, and the VII's 13 years 7 months. The mean age of the males was 12 years 9 months and of the females 12 years 6 months.

Insert Table 2 about here

Otis Test. The results of the Otis Quick Scoring Test of Mental Ability are shown in Table 3.

Insert Table 3 about here

There were significant Grade (age) differences in score and significant community differences, children in the smaller communities scoring lower (22.72) than those in the larger (24.36). The average overall IQ is 85, not surprising since the test is verbal and the people rural.

Progressive Matrices. Table 4 gives the results of the Raven Progressive Matrices. There were only grade (age) differences. The fact that there were no community differences is vitally important since it indicates

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Insert Table 4 about here

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equivalent levels of general intelligence in the two types of community. The average overally IQ is close to 90, or slightly higher than the average Otis IQ.

The Primary Mental Abilities Test (PMA). The PMA subtests will be considered separately.

1. Verbal meaning. See Table 5. The only significant difference (apart from age) was between communities. Children in the large communities

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Insert Table 5 about here

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scored higher (8.30) than children in the small communities (7.17). That sort of difference is not unusual and has been reported many times before (Anastasi, 1958; Tyler, 1965).

2. Space. Table 6 reveals grade (age), community and sex differences in spatial ability. There is also a significant grade (age) x sex interaction. Children in the small communities scored higher (7.99) than children in the large communities (6.12). Males scored higher (8.85) than females (4.30). The interaction is shown in Table 7. There were no significant differences

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Insert Table 6 about here

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among the female means while the Grade VII males scored higher than all the other groups. The interaction appears to show development of the ability in

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Insert Table 7 about here

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males and none in females. Sex differences in the ability are well known and have been documented many times before. The community differences are interesting since they are the reverse of those found on other tests. Whether the difference is due to differential experience can only be conjectured at this stage. The difference, though, bears further investigation.

3. Reasoning. Children in larger communities score higher (8.65) than those in smaller (7.02) and females score higher (8.67) than males (7.68) (see Table 8).

Insert Table 8 about here

The results are consistent with earlier findings on sex differences and rural-urban differences.

4. Number. Apart from grade (age), significant sex differences

appeared on number ability (see Table 9). Males scored lower (11.29) than females (13.20). Again, that sex difference is well documented.

Insert Table 9 about here

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5. Word fluency. Sex differences were found in word fluency. Males scored lower (21.46) than females (23.16) (see Table 10). Sex differences on word fluency are also well known.

Insert Table 10 about here

The results may be summarized in this way. There is no difference in level of general intelligence between children from large and small isolated communities. Nevertheless, children from large communities excel on a verbal intelligence test, on Verbal meaning and on Reasoning. Children in the small communities excel on the Space test. On Number and Word fluency there is no difference. It is clear, then, that different patterns of ability exist in the small as opposed to the large, isolated communities on the South Coast of Newfoundland.

Summary

Several major theorists of intellectual functioning, Ferguson, Vernon, and Cattell suggest that human abilities are malleable in children and that cultures impose differential stresses on children which lead to certain idiosyncratic patterns of abilities. We deduce from these theories that children moving from areas where patterns of ability are different will show changes in ability patterns in line with the stresses imposed by the new environment.

The South Coast of Newfoundland appears to be ideal to test that and related hypotheses because different patterns of ability do exist in the isolated communities there. Not only that, but the communities concerned are relatively homogeneous in racial stock, employment opportunities, income, and religion. At the same time the people are migrating from the small to the larges places, providing us with the conditions needed to test the theories.

In addition, the findings of Beach, Burnett and Sullivan (1963) indicate that the population with which we are dealing, when given the advantages that urban centres offer, show intellectual abilities not unlike those in urban centres in mainland Canada. Therefore, it may be possible for us to continue this type of project and trace children moving to still more sophisticated surroundings than those involved on the South Coast of Newfoundland. In that way we should be able to look more closely at some of the effects of environment than has been attempted before.

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TABLE 1

LARGE COMMUNITIES	School Population	Classrooms
Belleoram/English Harbour West	354	11
Burgeo	571	16
Harbour Breton	445	16
Hermitage	189	6
Ramea	343	11
MEAN	317	

SMALL COMMUNITIES		
Francois	74	3
Gaultois	147	5
Grole	45	2
McCallum	51	2
Parsons Harbour	14	2
Pass Island	49	2
Pushthrough	38	2
Rencontre East	82	3
Rencontre West	14	2
Seal Cove	102	4
Stone Valley	21	1
MEAN	57.9	

TABLE 2

VARIABLE AGE (months)

GRADE	LARGE M	LARGE F	SMALL M	SMALL F
5	141.5 85	141.7 84	140.3 35	137.5 34
6	153.8 83	148.2 62	154.4 37	150.5 28
7	165.2 77	161.3 71	163.2 24	163.3 25

Source	df	MS	F	p
GRADE	2	533.61	113.78	<.01
COMM	1	0.37		
SEX	1	20.02	4.27	<.05
G x C	2	3.99		
G x S	2	3.68		
C x S	1	0.44		
G x C x S	2	3.59		
error	633	4.69		

TABLE 3

VARIABLE OTIS SCORE

GRADE	LARGE M	LARGE F	SMALL M	SMALL F
5	18.6 85	20.0 84	17.2 35	18.5 34
6	23.7 83	26.9 62	24.9 37	24.3 28
7	29.3 77	29.6 71	27.2 24	26.9 25

Source	df	MS	F	p
GRADE	2	96.76	68.14	<.01
COMM	1	6.90	4.86	<.05
SEX	1	2.34		
G x C	2	0.78		
G x S	2	0.59		
C x S	1	1.69		
G x C x S	2	1.00		
error	633	1.42		

TABLE 4

VARIABLE PROGRESSIVE MATRICES SCORE

GRADE	LARGE M	LARGE F	SMALL M	SMALL F
5	23.2 85	23.2 82	24.7 35	24.9 34
6	27.2 85	24.3 63	26.2 37	25.0 28
7	29.6 77	30.5 71	29.6 24	26.0 29

Source	df	MS	F	p
GRADE	2	25.08	10.90	<.01
COMM	1	0.21		
SEX	1	3.63		
G x C	2	2.72		
G x S	2	1.20		
C x S	1	0.57		
G x C x S	2	2.61		
error	638	2.30		

TABLE 5

VARIABLE VERBAL MEANING

GRADE	LARGE M	LARGE F	SMALL M	SMALL F
5	5.1 53	5.5 54	5.0 30	5.7 31
6	7.7 83	8.5 64	7.3 38	8.1 28
7	10.4 77	11.1 70	9.4 24	8.2 28

Source	df	MS	F	p
GRADE	2	19.97	34.43	<.01
COMM	1	1.77	3.05	<.05 one-tail
SEX	1	0.41		
G x C	2	1.09		
G x S	2	0.30		
C x S	1	0.20		
G x C x S	2	0.37		
error	568	0.58		

TABLE 6

VARIABLE SPACE

GRADE	LARGE M	LARGE F	SMALL M	SMALL F
5	3.6 53	-0.6 54	6.1 30	6.0 31
6	7.5 83	5.4 63	9.4 37	6.4 28
7	12.5 77	5.3 70	16.0 24	5.0 27

Source	df	MS	F	p
GRADE	2	35.36	11.99	<.01
COMM	1	19.26	6.53	<.05
SEX	1	63.48	21.52	<.01
G x C	2	3.06		
G x S	2	15.23	5.16	<.05
C x S	1	0.03		
G x C x S	2	3.99		
error	565	2.95		

TABLE 7

SEX X GRADE INTERACTION ON SPACE TEST

		GRADE		
		5	6	7
SEX	M	4.5	8.1	13.3
	F	2.1	5.1	5.2

TABLE 8

VARIABLE REASONING

GRADE	LARGE M	LARGE F	SMALL M	SMALL F
5	6.3 53	6.6 54	5.1 30	6.4 31
6	8.5 85	9.8 63	6.7 37	8.1 27
7	9.2 77	10.5 70	7.6 24	8.5 29

Source	df	MS	F	p
GRADE	2	8.87	7.92	<.01
COMM	1	6.02	5.38	<.05
SEX	1	3.52	3.14	<.05 one tail
G x C	2	0.39		
G x S	2	0.08		
C x S	1	0.04		
G x C x S	2	0.12		
error	568	1.12		

TABLE 9

VARIABLE NUMBER

GRADE	LARGE M	LARGE F	SMALL M	SMALL F
5	6.3 53	9.0 54	8.7 30	9.0 31
6	12.2 85	13.8 63	10.0 37	15.7 28
7	14.3 77	16.2 70	14.4 25	14.7 29

Source	df	MS	F	p
GRADE	2	46.65	36.45	<.01
COMM	1	0.04		
SEX	1	13.02	10.17	<.01
G x C	2	0.96		
G x S	2	1.88		
C x S	1	0		
G x C x S	2	3.14		
error	570	1.28		

TABLE 10

VARIABLE WORD FLUENCY

GRADE	LARGE M	LARGE F	SMALL M	SMALL F
5	16.3 53	19.5 54	17.8 30	18.0 31
6	21.9 85	23.7 63	21.6 37	24.8 28
7	25.1 77	26.4 70	23.8 25	25.1 29

Source	df	MS	F	p
GRADE	2	54.84	30.64	<.01
COMM	1	0.27		
SEX	1	10.08	5.63	<.05
G x C	2	0.79		
G x S	2	0.38		
C x S	1	0.22		
G x C x S	2	1.26		
error	570	1.79		